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(74) Agent: HAINES, Miles; D Young & Co, 21 New Fetter Lane, London EC4A 1DA (GB).

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(71) Applicant (*for all designated States except US*): SILECS, INC. [FI/FI]; Silecs Oy, Tietotie 3, FIN-02150 Espoo (FI).

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(72) Inventors; and

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(75) Inventors/Applicants (*for US only*): RANTALA, Juha, T. [FI/FI]; Kanavaranta 7 B 19, FIN-90100 Oulu (FI). MAANINEN, Arto, L., T. [FI/FI]; Luotolaistentie 12 C 13, FIN-90540 Oulu (FI). MAANINEN, Tiina, J. [FI/FI]; Luotolaistentie 12 C 13, FIN-90540 Oulu (FI). PIETIKAINEN, Jarkko, J. [FI/FI]; Tapiontie 13C11, FIN-90570 Oulu (FI).

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(54) Title: MATERIALS AND METHODS FOR FORMING HYBRID ORGANIC-INORGANIC DIELECTRIC MATERIALS

(57) Abstract: The present invention generally relates to methods for making dielectrics for integrated circuit processes and devices. More particularly, the invention relates to multi-level circuit processes, such as damascene processes that utilize metal and metal alloys (e.g., copper and copper alloys) as well as low-k dielectric materials. The methods of the present invention allow for greater control of the dielectric fabrication process.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER		
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C07F C08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 21924 A (QUESTER TECHNOLOGY, INC., USA) 6 May 1999 (1999-05-06) the whole document	1-131
X	VAKS, E. A. ET AL: "Radiochemical synthesis of dichlorotrifluorophenyl and dichloro(trifluoromethyl)phenyl derivatives of silicon" ZHURNAL OBSHCHEI KHMII (1977), 47(4), 782-5, 1977, XP002243352 Table I ---- -/-	1-28, 32-76, 78-129, 131

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Rinkel, L

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	VAKS, E. A. ET AL: "Radiation-chemical synthesis of polyfluoroaromatic derivatives of silicon affected by accelerated electrons" ZHURNAL OБSHCHEI KHMII (1975), 45(6), 1315-22 , 1975, XP002243353 Table I ---	1-28, 32-76, 78-129, 131
X	DATABASE CA 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; ROMASHKIN, I. V. ET AL: "Synthesis of fluoroorganosilicon compounds containing a phenylene bridge" retrieved from STN Database accession no. 78:84483 CA XP002243354 abstract & ZHURNAL OБSHCHEI KHMII (1972), 42(11), 2490-4 , 1972, ---	1-28, 32-76, 78-129, 131
X	DATABASE CA 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; ROSCHER, C. ET AL: "Perfluoroaryl substituted inorganic-organic hybrid materials" retrieved from STN Database accession no. 125:336678 CA XP002243355 abstract & MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS (1996), 435(BETTER CERAMICS THROUGH CHEMISTRY VII: ORGANIC/INORGANIC HYBRID MATERIALS), 547-552 , 1996, ---	1-28, 32-76, 78-129, 131
X	FROHN, H.-J. ET AL: "Reactions of methyl(pentafluorophenyl)- and methyl(pentafluorophenyl)phenylsilanes with electrophiles. A convenient preparative route to halo(methyl)pentafluorophenylsilanes C ₆ F ₅ SiMe ₂ X and C ₆ F ₅ SiMeX ₂ (X = F, Cl and Br)" JOURNAL OF ORGANOMETALLIC CHEMISTRY (1998), 570(2), 255-263 , 1998, XP004142856 the whole document ---	1-28, 32-76, 78-129, 131

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INTERNATIONAL SEARCH REPORT

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PCT/IB 03/00337	

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FROHN, H. J. ET AL: "A convenient preparation of pentafluorophenyl(fluoro)silanes: reactivity of pentafluorophenyltrifluorosilane" JOURNAL OF ORGANOMETALLIC CHEMISTRY (1996), 506(1-2), 155-64 , 1996, XP004092795 the whole document ---	1-28, 32-76, 78-129, 131
X	US 3 853 726 A (VAINSHTEIN, B. I. ET AL) 10 December 1974 (1974-12-10) the whole document ---	1-28, 32-76, 78-129, 131
X	DATABASE CA 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; IKUTA, SHIGEO ET AL: "Production method of chemically absorptive film with good oil and water resistance" retrieved from STN Database accession no. 131:338334 CA XP002243930 abstract & JP 11 319708 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD., JAPAN) 24 November 1999 (1999-11-24) -----	1-28, 32-76, 78-129, 131

INTERNATIONAL SEARCH REPORT

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PCT/IB 03/00337

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO 9921924	A	06-05-1999	US AU JP WO US US	6020458 A 1092099 A 2001521045 T 9921924 A1 6258407 B1 2001029110 A1		01-02-2000 17-05-1999 06-11-2001 06-05-1999 10-07-2001 11-10-2001
US 3853726	A	10-12-1974	DE FR GB IT	2132569 A1 2100122 A5 1336926 A 941420 B		10-02-1972 17-03-1972 14-11-1973 01-03-1973
JP 11319708	A	24-11-1999	NONE			